THE PLANT DISEASE BULLETIN

Issued By

THE PLANT DISEASE SURVEY

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THE PLANT DISEASE BULLETIN

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Present status of take-all and flag smut surveys reported in this issue.

Ophiobolus found associated with serious foot rot developments in New York, Indiana, Arkansas, and Oregon. The fungus reported on wild grasses in New York and Arkansas.

Other important foot rots and root rots of wheat in Illinois, Kentucky, Kansas and other states.

Flag smut present in St. Clair County, Illinois, as well as in Madison County.

Downy mildew of wheat in western Tennessee and Kentucky, also collected in California - first reports for the United States.

Wheat nematode found in Wilkes County, North Carolina.

Leaf rust of wheat reported unusually serious.

Reports on frost injury and potato germination troubles.

Development of new tobacco disease in Florida and Georgia checked by hot dry weather.

WHEAT

The Take-All Survey

The Plant Disease Survey, in cooperation with the Office of Cereal Investigations and Plant Disease Survey collaborators, has continued the take-all survey the present season. Posters illustrating take-all and flag smut, together with descriptive literature were distributed by collaborators to county agents, growers, and others in all the wheat-growing states. Effort was made in this and in other ways to develop interest in a wheat news service, with especial reference to take-all and similar troubles. Travel letters were issued to collaborators in order that diseased spots reported in wheat fields might be visited and the conditions personally investigated. In this way we hoped to accumulate, during the season of 1921, extensive information on the distribution and severity of take-all and other foot rots and root rots of wheat, and also a body of comparative field data of value to those investigating this type of disease.

The plan has worked well. Many specimens suspected of having take-all have been sent to the state experiment stations and the suspicious cases personally investigated by collaborators and by federal pathologists. The survey is still under way and only a progress report can be made at this time. A complete report will appear in a later issue of the Bulletin when the survey has been completed and final reports have been received from all states.

Thus far, Ophiobolus (probably Ophiobolus graminis) has been found this year in New York, Indiana, Arkansas, and Oregon where it is associated with extensive diseased areas in wheat fields. In addition, important outbreaks of foot rot and root rot, with which Ophiobolus has not yet been definitely connected, have been investigated in Illinois, Kentucky and Kansas, with less extensive occurrences elsewhere.

New York: Ophiobolus was first reported from New York in 1920 where it was found July 15 in a single spot in a field at East Rochester, Monroe County.

On June 4, 1921, Mr. L. C. Tyler, field assistant of the Cornell Agricultural Experiment Station, found Ophiobolus in fields near Batavia in Genesee County. Mr. Tyler has published the following report in the New York State Agricultural College Weekly News Letter:

> "On Saturday, June 4, take-all disease of wheat (Ophiobolus graminis) was discovered in several fields just northeast of Batavia. A further survey was made and a total of nine fields were found to contain the disease. In practically all of the diseased fields there occur a large number of irregular rounded or oblong dead areas varying in size from one foot or less to six or eight feet in diameter. In many cases isolated diseased plants could be found surrounded by plants which were apparently normal. Little relation can be seen thus far between the occurrence of the spots and the topography of the fields. In two or three poorly drained areas the disease seemed somewhat more severe. Seemingly, as many spots are found on high ground as on low ground. Neither does the type of soil seem to affect the occurrence of the fungus. Many dead areas are surrounded by some of the best and largest wheat in the fields. The growers practice a three to five

year rotation which frequently includes oats and wheat or barley and wheat on successive years. The wheat straw on some of the farms examined is regularly returned with the barnyard manure to the soil. The fields which were most seriously affected had received an application of manure which included wheat straw within the last two years. In one case two adjacent fields on the same farm were planted with seed from the same source on similar soil. One (manured in 1920) was badly diseased while the other (last manured in 1917) was apparently free from take-all. Further information which would throw light on the method of spread of the fungus is very badly needed. The growers with one exception report that they have not observed such diseased spots in their fields in previous years."

H. E. Thomas and R. S. Kirby have visited Genesee and neighboring counties and find Ophiobolus prevalent in a large territory south of Lake Ontario, including several counties. The disease is most severe in fields of No. 6 Junior, a variety of wheat developed in western New York and now being improved and extensively grown. The situation is further complicated by Kirby's discovery of the disease on Agropyron repens. He says:

"Friday, June 10, Dr. Thomas and I went over a number of wheat fields in Genesee County (Batavia). The situation there is very serious on account of the general prevalence of the disease in so many fields. I also found Agropyron repens infected with the take-all. The general prevalence of this grass in so many fields will almost defeat any effort of control of this disease by rotation."

Kentucky: Valleau submits the following report:

"On May 13 and 14 I made an inspection trip through Logan and Christian Counties where there have been reports of considerable trouble in wheat. I was unable to find any signs of the flag smut or take-all, but there was considerable evidence of severe rot in practically every field that we examined. In the worst fields it appeared to be the cause of severe stunting of certain plants, these plants never attaining a height of more than 3 or 4 inches when they died at about blossoming time. Other plants did not stool out, and sent up only a single short stalk which produced a small, short head; others stooled out and in many cases most of the shoots died when about 4 to 8 inches high. The remainder, however, fruited normally. We have found the same conditions to exist in most of the fields examined about Lexington. The cause of the root trouble I have not definitely determined, but from some work done the past winter on root diseases of wheat, in which about sixty varieties were worked with, I found rather a high percentage of seed infection with Helminthosporium and also some wheat scab infection. There was a marked contrast, between fields planted from the ordinary varieties and from pure line selections. Where Ashland was used, the stand, by actual counts made by Mr. Kenney, was 25% better than the stand of

Currell's Prolific which is a mixture of strains. This increased stand was due primarily to greater uniformity in the number of culms produced, practically none of the severely stunted plants being found. It appears from our work so far that this root trouble may be handled to quite an extent by selecting resistant strains and eliminating the low yielding very susceptible strains from our varieties. I feel fairly confident that the percentage of seed infection with pathogenic organisms capable of causing root rot is sufficiently high so that practically complete root infection will take place in the field very soon after the seed is sown."

Arkansas: Rosen found Ophiobolus associated with serious foot rot in two fields near Fayetteville. The first field had been used as a red top and timothy pasture for twelve to fourteen years. The soil is a fine silt loam, poorly drained, though not particularly lacking in plant food. Although worse in spots, the disease was generally prevalent throughout the whole field of eleven acres, with no noticeable relationship between the diseased spots and topography of the field. Another wheat field on the same farm had no sign of the Ophiobolus disease, although the seed came from the same source as the badly diseased field. The healthy field had been previously fertilized, and as far as the owner knew, was entirely similar in all other respects to the diseased field.

The second infested field resembled the first in character of soil and in poor drainage. Ophiobolus was confined to three acres which had been in a peach orchard until last fall, when the trees were cut and wheat sown. The remainder of the field was in wheat last year, corn in 1919, and clover for three years previous to that.

The source of the infection in these cases did not appear to be diseased seed, and careful search was made in and about the infested fields for signs of the disease on wild grasses. Species of Festuca, Bromus, and Hordeum were found which seemed to have the disease although no perithecia were present. A letter just received from Dr. Rosen reports typical perithecia of Ophiobolus on the perennial foxtail, Setaria geniculata, collected on the college campus at Fayetteville.

Indiana: Jackson recently found immature Ophiobolus associated with diseased spots in three fields on a farm near Vincennes in Knox County, southwestern Indiana. The spots were mostly small, and the damage to the crop slight.

The quarantined area in Porter and LaPorte Counties where so-called take-all was present last season has been repeatedly examined this year. The disease has reappeared in the experimental plats at Wanatah, but not in commercial fields. Mr. J. B. Kendrick on June 17 again visited the quarantined area and examined both spring and winter wheat but no take-all was found.

Illinois: The so-called take-all has appeared again this year in the quarantined area in Madison County. In addition, Dungan reports the disease in one field of Red Cross wheat near Lincoln, Logan County, where it has developed in typical form. Conditions in the field indicate that the disease has been distributed by farm implements and by the feet of the work horses.

Kansas: An interesting and serious foot rot has developed in many fields in

Dickinson County and in one field in Saline County, and has been given special study by Melchers and Mc Kinney. The causal organism has not yet been definitely determined. There are points of resemblance to, and also of difference from, the so-called take-all of Madison County, Illinois, and the Ophiobolus disease found in Arkansas by Rosen. McKinney says: "It is my belief that we are seeing the beginning of a disease which is capable of causing much destruction."

Mr. John T. Pearson has been surveying the Dickinson County region and says:

> "So far as I have been able to observe, the character of the soil and the variety of wheat have little, if anything, to do with whether or not the field is diseased with foot rot. In Dickinson County foot rot occurs in both soft and hard wheat fields and in Kanred wheat fields. I have located the disease on land that has been under cultivation thirty years or more and in fields that have been broken from the prairie not more than six or eight years. However, I have never found it in fields where crops have been rotated and the ground was not in wheat last year. Many of the fields where I located foot rot have been in wheat every year for the past eight or ten years."

Root rots of different character from the foot rot in Dickinson County have been reported in serious amounts from numerous other points in Kansas. Melchers writes under date of June 6:

> "As the matter now stands, it seems as though we have two distinct problems in the state. The one in Dickinson County where the wheat is dying out in spots, has also been found at our agronomy farm here in Riley County. Probably the same trouble exists in Cheyenne and Ellis Counties. From the majority of fields which have been reported injured and where Mr. Pearson has made examinations, we find another trouble which no doubt is the most common in the state this year. Plants are dying more or less all over the field. I attribute this injury to a number of factors in combination with one another.
>
> "The late freezes caused a great deal of refuse to accumulate on the ground and chiefly around the crown of the plants. In many places there was a considerable lack of rain. The soil also has been seriously depleted in many of these fields. Placing the plants under these conditions, together with excessive tillering, has produced a strain on the root system which it cannot meet. I believe that a great deal of this refuse material is a harboring place for semi-saprophytic and partially parasitic organisms which together with the organisms in the soil, have been responsible for a decay of the root system."

Washington: A very serious foot rot has developed in the vicinity of Spokane, exceeding the condition found there last year. Heald makes a preliminary report as follows:

> "For two days I have been looking over wheat fields near Spokane. The foot rot condition seems worse after the second day's work. One field showed 100% infection. The disease seems much more serious than in previous years. I wish you could see some of the wrecked wheat fields. They certainly beat anything I have seen before."

Oregon: Barss has found Ophiobolus in the neighborhood of Hillsboro and suspects that the same disease exists in a number of other sections of the state

from which reports of spotted wheat fields have been sent in. These reports are now being investigated and the fields examined. The loss in some cases is estimated at one-third of the crop, the spots ranging up to 100 feet in diameter.

Flag Smut caused by Urocystis tritici

During the present season further survey work on flag smut has been conducted by the Illinois State and the United States Departments of Agriculture. A rather extensive survey was made of wheat fields along the Mississippi River, northwestern Tennessee, southeastern Missouri and western Illinois as far north as the junction of the Mississippi and Missouri Rivers. Some work was also done up the Missouri River Valley through Warren and Franklin Counties and up the eastern side of the Illinois River Valley to Mason County. Between seven and eight thousand acres of wheat were inspected in the Mississippi bottom lands between Cairo and East St. Louis.

A more intensive search was made in wheat fields within the quarantined area about Granite City and in the vicinity.

As a result of this season's work two important facts regarding the geographical range of flag smut have been developed. (1) The original Granite City area, where flag smut occurs, has been enlarged and extended and (2) a new center of infection, which may be called the Dupo area, has been located south of Granite City in St. Clair County, Illinois.

In the Granite City district flag smut was found last year in 111 fields on about 66 farms. This year it was found to be present in 211 fields on 121 farms, an increase of 100 fields over last year. The reason for this may be explained in two ways: In the first place, more men and a longer working period gave opportunity for a more thorough and extended search than in 1920; and in the second place, it is probably true that the disease has spread during the past year to new fields. The area of infestation about Granite City as known today is about 13 miles long and 6 miles wide at the widest point, and comprises an area of approximately 50 square miles.

The Dupo area, south of East St. Louis, and which was found for the first time this year, has been delimited by survey and found to contain 57 infested fields on 30 farms. It is more or less rectangular in

shape and is about 3 x 3 1/2 miles in dimension with two rather small outlying areas. About one-third of the infested fields are on bottom land and the other two-thirds are up on high land, about 200 feet above the river flood-plain.

Regarding the seriousness of flag smut in these districts, it may be said that it is not causing any appreciable loss at present. In a majority of fields only a trace of the disease was found so that for the region as a whole there will be no loss. In a few fields, however, spots were found where a slight reduction in yield was being caused. By far the highest percentage of affected plants was found in one field that showed an average of 15%. This was an exceptional case, but it goes to show that the disease can become serious under Illinois conditions. A comparison with last year's data with this year's indicates that the disease is not progressing in severity but is being held in check and perhaps slightly reduced, if anything.

In the light of this season's survey work the quarantined boundary lines have been extended to cover the areas of infestation and a vigorous control program is being instituted by the Illinois State Department of Agriculture, under the leadership of P. A. Glenn. In general, the plans for controlling the disease are as follows:

(1) All grain is to be treated at the threshing machine as it comes from the separator by spraying it with concentrated formaldehyde at such strength and rate as will kill the smut spores and make the seed useless for planting purposes.

(2) Threshing machines used for threshing grain grown inside of the infested areas, are not to be used outside the quarantined zones during the present year.

(3) Threshing machines inside of the areas must be disinfected with formaldehyde before threshing oats or other grains the straw of which the farmers wish to preserve.

(4) Machines that have been used for threshing wheat must be disinfected with formaldehyde at the close of the season.

(5) Farmers are required to plant such varieties as the State Department of Agriculture shall recommend. These varieties will be those that have shown resistance to flag smut during the past two years.

(6) Seed is to be treated with copper sulphate and lime before planting in the fall.

(7) Wheat straw is to be burned by September 1, 1921.

A more complete report of the flag smut survey will be given in a later number of the Plant Disease Bulletin.

Wheat nematode (Tylenchus tritici)

A. C. Foster, Extension Plant Pathologist with the North Carolina Experiment Station and Collaborator with this Office, reported that nematode galls in wheat heads were received at West Raleigh on April 10 from A. J. Hendren, County Agent for Wilkes County, North Carolina. More recent letters from Mr. Hendren state that nematode galls had been located on about a dozen farms in widely scattered localities in the county and in several instances the disease had become serious. Foster recently made a survey for nematode and other wheat diseases in North Carolina, during which he visited Buncombe, Wilkes, Surry, Alexander, Yadkin, Forsyth, Rockingham, Guilford, and Durham Counties. These are the leading wheat producing counties in the state, and are said to obtain most of their seed wheat from Virginia. Nematode was found only in Wilkes County, where it was prevalent and serious in two sections. Foster was able to trace the source of the seed wheat used in the infested plantings. The following quotation is taken from his report, dated June 23:

> "In Wilkes County wheat nematode was reported to occur for the first time in this state. We found wheat nematode galls in two sections, rather prevalent where found, and possibly causing a loss of 10-20% of the crop. It was rather common in this section last year and some of the growers claimed they had observed it in their wheat and that of certain neighbors for the past five years, varying in the amount of damage done. I traced the history of the seed wheat planted and it was always traced to wheat which originally came from Virginia, through the Wood Seed Co., of Richmond. I inspected the mills in the county, and while I did not find evidence of galls in the screenings, the millers claimed to have found them last year."

Downy mildew caused by Sclerospora macrospora Sacc.

During the course of the wheat flag smut survey conducted by the Plant Disease Survey in cooperation with the Office of Cereal Investigations, L. W. Leukel discovered a disease of wheat at Union City, Tennessee on April 19 which is new to the United States. Specimens sent to Madison, Wisconsin and also to Washington showed the disease to be caused by the downy mildew Sclerospora macrospora. W. H. Weston of the Office of Cereal Investigations immediately went to Union City and made a study of the disease there. The report of his observations and the statement of the general situation has just been issued as Department Circular 186, United States Department of Agriculture. Collaborators and others should obtain this circular which gives the present status of the disease including geographic range, symptoms, hosts, losses, etc.

During the present season the disease has been found in the following places: Tennessee, Jackson County (Jackson), Obion County (Rives, Hossier Valley, Union City, and Woodward Mills); Kentucky, Fulton County (Jordan and vicinity). According to Weston it seems probable that it will be found in adjacent counties in Illinois and possibly in Arkansas and Missouri. Diseased specimens in the pathologic herbarium at Berkeley, California, show that downy mildew occurred on wheat in Kings County, California, in May 1919.

The losses in western Tennessee and Kentucky are apparently very slight. Downy mildew occurs on wet, poorly drained land where large numbers of plants are affected and destroyed, but as such areas represent only a very small proportion of the whole wheat district, and as the disease is closely restricted to these poorly drained localities, the total loss is not great. However, the loss is

persistent year after year so that in the aggregate it becomes considerable. In certain restricted areas in Europe there have been occasional reports of very severe destruction of wheat and maize. There is reason to believe, therefore, that under conditions favorable to the disease it may become of considerably more importance in the United States than at present.

Not only did Weston find wheat affected in western Tennessee, but also Bromus commutatus Schrad. In Europe the disease is found commonly on maize and occasionally on oats, barley, rye, and several wild grasses of the genera Phalaris, Phragmites, Glyceria, Agropyron, and Lolium.

Weston states that general indications from field conditions in Tennessee and Kentucky are that "the disease is not of sudden or recent appearance, but has been present for many years". This statement together with the known occurrence of the disease in California in 1919, indicates that careful search may reveal the presence of downy mildew in other states.

Leaf rust caused by Puccinia triticina.

Leaf rust is apparently causing much more injury than usual this year in a number of states, including New York, Virginia, West Virginia, Tennessee, North Carolina, Texas, Oklahoma, and Ohio. In West Virginia the disease has been so severe in the Kanawha and Ohio Valley that on May 13 a 50% reduction in yield was feared in that section. The poorest crop of wheat produced in years is reported from Buncombe County, North Carolina, due mainly to leaf rust, which is severe in other counties of that state also. In Tennessee, according to C. D. Sherbakoff, the disease appeared much earlier than usual and caused damage estimated at about 10%, ranging from very light in the case of late planted fields or those with rust resistant varieties to about 40% in the earlier planted fields and those with susceptible varieties. In Oklahoma also leaf rust is said to have caused most deterioration in the earlier fields.

Stem rust caused by Puccinia graminis.

No reports have been received indicating any general damage from stem rust.

FRUITS

Frost injury to fruit crops.

The heaviest damage to fruit from the frosts of March and April occurred in a belt extending through the central portion of the country, including the southern part of New England to North Carolina and westward to the Rocky Mountains. The amount of injury diminished northward, due perhaps to the fact that the fruit buds did not develop so early; and southward, where the freezes were not so severe. In general the Pacific Coast States, except parts of California, Idaho, and Utah escaped severe damage, although in some cases cold weather at blooming time prevented a normal set of fruit. According to recent estimates, the main fruit-growing sections of Colorado will probably produce good crops.

Of the southern states, New Mexico and Arizona suffered severely, and some damage was sustained by the more susceptible fruits in the Gulf States and Georgia.

A more detailed account of the effects of the frosts is given by E. V. Wilcox in the Country Gentleman for June 18, page 6.
Collaborators' reports are given below.

Apple

Massachusetts: The apple crop was hard hit in all parts of the state by the freeze of May 12. The most serious damage, however, was in the eastern part of the state, especially in Middlesex County, where from 75-90% of the fruit set on Baldwin and McIntosh was ruined. Early varieties such as Gravenstein did not suffer to any great extent. The same varieties were injured in the western part of the state, but a much smaller percentage was ruined. (Osmun, May 24).

New Jersey: The apple losses due to frost will amount to fully 50%. (Cook, May 16).

Pennsylvania: Probable percentage of normal crop as reported by county agents ranges from 5% to 85%, averaging 41% in the counties reporting. These figures are in some cases perhaps too low. They represent more nearly the percentage of blossoms killed. (Thurston, June 1).

Delaware: Probably 50 to 60% of the apples have been killed and I am inclined to believe that more than 60% will fall before the season is over due to frost trouble. (Manns, May 13).

Apples were not so severely affected as the pears and peaches in the frost of March 27 and 28. The early leaves are badly frost blistered. The following estimate of a normal set is observed for named varieties: Williams and Staymans 40-50%, Rome 80%, York 75%, Jonathan 30-50%, Grimes 10%, Paragon 25%, Duchess, Nero, and Yellow Transparent 10%. Dean McCue estimates a 50% reduction in yield of apples from frost. (J.F. Adams, May 14).

Virginia: The cold and frost injury to the fruit crop of this state has been extremely severe. The injury to apples appears to vary somewhat in different sections. Here at Blacksburg we do not have a single apple left on the trees and that condition seems to be true of southwestern Virginia in general. There is a light crop in the Shenandoah Valley section on certain varieties and the crop in certain sections of the Piedmont area, especially in the northern part, seems to be less injured than in other parts of the state. I have heard of some orchards in this section that will probably have 20% of a crop. The apple crop of the state as a whole will probably not exceed 8% or 10% at the outside. (Fromme, May 13).

(Rockbridge County) - From what I can learn all fruits in this county, and apparently in this whole region, have been practically completely destroyed. A few late blooming apple trees have a few fruits on them, but not enough to count. From the reports, there will be practically no apples produced in this region this year. (W. D. Hoyt, June 11).

West Virginia: The apples in the Kanawha Valley are reported as not more than 2 to 5% of a crop and many of these show frost bands. In the eastern part of the state (Berkeley and Jefferson Counties) the crop is very irregular, some orchards claiming 100% and showing evidence of that much at present. Other orchards have practically nothing. (Giddings, May 13).

Kentucky: The fruit crop, including peaches, cherries, and apples, has been completely ruined throughout the Bluegrass section of Kentucky and probably along the Ohio River in the western end of the state, although I am not positive as to the extent of injury there. In the southwestern part of the state in Christian and Logan Counties, late apples were not injured to any great extent, although they were in partial bloom at the time of the last freeze. (Valleau, May 16).

North Carolina: The frost killed all the apples in the mountain section. I was at the Pender Test Farm Tuesday and made it a point to note carefully

the damage done there by the frosts. All the apples were killed. (Foster, April 23).

Arkansas: All fruit except a small percent of late strawberries was killed by frost in northwest Arkansas during April. (Elliott, May 16).

Ohio: There appears to be but a very light proportion of apples left uninjured from the latitude of Columbus southward. The large growers of the southeastern Rome Beauty district report practically everything killed by the freeze except a small proportion of late blossoms which may set some fruit. In the south-central area late blooming varieties indicate half a crop or more. The condition of the central portion of the state is represented by a Licking County report of April 12 stating 50% of Grimes and Jonathan buds alive, Rome, Spy, and York but slightly injured; thus from Columbus northward injury to apples is slight and confined to early blooming varieties (Astrachan, Baltimore, Bentley (sweet), Duling, Early Harvest, Gravenstein, Mann, Ohio Nonpareil, Oldenburg, Tompkins King). Apples of blooming period coincident with that of Rome Beauty or later have suffered practically no injury. (Selby, May 14).

Illinois: The apple crop will be about 10% of a normal crop. The southern third of the state will have about 5%, the central portion 10-15%, and the northern portion 30-40%. Since the larger portion of the apples are grown in southern Illinois, this means a proportionately heavier loss than if the greatest damage had occurred in the northern part of the state. The damage to different varieties varies greatly in different sections of the state and in different orchards. In some cases early fruit suffered more severely than late fruit, and in other cases the reverse was true. In general early varieties suffered most severely. The extreme southern end of the state depends largely upon early varieties such as Duchess and Transparent, and consequently the loss there has been usually heavy. A great deal of indirect damage was done by the freeze, as indicated by the heavy June drop. In some cases apples which had started to grow stopped developing and were found to be black in the core. These of course all dropped. (Anderson, June 9).

Nebraska: Late blooming winter apples such as Jonathan, Winesap, Black Twig, Ben Davis, etc., promise from 10-60% of a crop in eastern Nebraska. (R. F. Howard, May 17).

Utah: Frost injury to fruit in the various districts of Utah that I have visited has not been quite so severe as was first reported. Apples did not suffer particularly from the frost during the month of April. The whorls of leaves around the blossom clusters are badly crinkled and frost blistered but the blossoms themselves seem to have remained untouched by the low temperatures. Orchards throughout the districts that I have seen bloomed quite profusely, although the bloom was not so heavy in some varieties, particularly Winesap. The general low temperatures throughout April, aside from the actual freezes, contributed to lack of pollination inasmuch as insects were not abundant in the orchards. (O'Gara, May 16).

Nevada: The fruit crop of northern and central Nevada is almost a total loss this year because of frost. The temperature was unusually warm this year in January and February. This caused the buds to swell very early and was followed in April by severe frosts throughout the month. Apples are almost a total loss in central and west-central Nevada. (Lantz, May 23).

Oregon: Around Medford and Central Point in Jackson County apples were not hurt. In the Umpqua Valley, in Douglas County there was no injury whatsoever to fruit from frost. No injury is reported in the Willamette Valley. No frost damage to fruit has been reported to the eastward along the Columbia River. (Barss, May 18).

Pear

Massachusetts: In the eastern part of the state pear fruit was almost totally ruined. (Osmun, May 24).

Pennsylvania: Probable percentage of normal crop 75% in Center County, 50% in Schuylkill County. (Thurston, June 1).

Delaware: All pears are killed. (Manns, May 13).

Pears were severely affected by the freeze of March 27 and 28 and the damage is represented not only by the complete loss of fruit but also with considerable of the new growth being killed. In many sections the trees from a distance now appear as if severely affected with fire-blight. Dean McCue estimates pears a total loss in Delaware. (Adams, May 14).

Virginia: (Rockbridge County) - From the reports there will be no pears produced in this region this year. (Hoyt, June 11).

Ohio: Very severe injury from freezing reported over entire state outside of the lake protected area. Practically no Kieffer pears escaped destruction from Wooster southward. A small proportion of some other varieties have set in the latitude of Wooster. The proportion in the lake shore area is not known to us. (Selby, May 14).

Illinois: Pears seem to have suffered worse than any other fruit and I know of no orchard where there are any pears at all, although I have not heard from northern Illinois. (Anderson, June 9).

Utah: Pears have suffered some but in the main there seems to be a fairly good set, although I am of the impression that the drop will be heavy. Bartlett pears seem to be lighter than the other varieties. (O'Gara, May 16).

Nevada: Pears are almost a total loss in central and west-central Nevada. (Lantz, May 23).

Oregon: Around Medford and Central Point in Jackson County, which is the center of a large pear growing district, those pear orchards which were smudged at the proper time came through all right, but practically all of the pears which were not smudged around those two centers at least were very badly injured by the frost and it is expected that this section of the state will harvest only about 50% of a crop as a consequence. Going northward into the Umpqua Valley, we find that in Douglas County there was no injury whatsoever by frost to fruit. Farther north in the Willamette Valley no injury is reported to fruits other than peaches. To the eastward along the Columbia River no frost damage to fruit has been reported but in the Walla Walla Valley it is reported that pears were hurt to some extent, but no exact estimate is available. (Barss, May 18).

Peach

Massachusetts: Peaches were not hurt by the freeze of April 19 and 20. (Osmun, May 24).

New Jersey: The peach losses of the state due to frost will amount to fully 75%. (Cook, May 16).

Pennsylvania: Probable percentage of normal crop ranges from none in Delaware County to 75% in Erie and Northampton Counties. The most severe injury occurred in the southern and southwestern parts of the state, several counties reporting only 2% or 5% of a crop. The average crop in the counties reporting is about 25%. (Thurston, June 1).

Delaware: All the peaches are killed. (Manns, May 13).

Peaches, particularly the early varieties, are a complete loss, due to the frost of March 27 and 28, but to date no serious injury to the new

growth has been observed. Dean McCue estimates a 95% reduction in yield of peaches from frost injury. (Adams, May 14).

Virginia: The cold and frost injury to the fruit crop of this state has been extremely severe. Peaches seem to be practically all destroyed throughout the state. (Fromme, May 13).

(Rockbridge County) - From the reports, there will be no peaches produced in this region this year. (Hoyt, June 11).

West Virginia: The stone fruits are very largely killed in the eastern and southern parts of the state. I am not so certain as to conditions in the central part. (Giddings, May 13).

Kentucky: The fruit crop, including peaches, has been completely ruined throughout the Bluegrass section of Kentucky, and probably along the Ohio River in the western end of the state, although I am not positive as to the extent of injury there. (Valleau, May 16).

North Carolina: I understand the peach crop has been wiped out over the entire state with the exception of the area around what is known as the "sand hills", near Pinehurst and Southern Pines. (Foster, April 23).

South Carolina: Peaches have been damaged very seriously in some places, and in others not enough to obviate the necessity of thinning. (Ludwig, May 14)

Arkansas: All fruit except a small percent of late strawberries was killed by frost in northwest Arkansas during April. In the southern part of the state peaches escaped. (Elliott, May 16).

Ohio: Peaches are reported killed by freezing in the whole state except the peninsula and island district of Ottawa County, and the peach orchards adjacent to Lake Erie in other counties. (Selby, May 14).

Illinois: Peaches are grown almost exclusively in the southern half of the state, although there are a few scattered orchards in the northern portion of the state. The southern peach crop is completely killed, except a few orchards north of Cairo. It would be safe to say that there is less than one percent of a crop. (Anderson, June 9).

Utah: Frost injury to fruit in the various districts of Utah that I have visited has not been quite so severe as was first reported. It was thought that there would be very few peaches, but it now appears that there will be a good peach crop. It may be assumed that Utah will have a much better fruit crop than was anticipated even two weeks ago. (O'Gara, May 16).

Nevada: Peaches are almost a total loss in central and west-central Nevada. (Lantz, May 23).

Oregon: In Jackson County in the Rogue River Valley and probably in Josephine County the peach crop was wiped out by frost. In the Willamette Valley peaches are damaged by frosts to the extent that only about 15% of a crop will be harvested. In the Walla Walla Valley it is reported that peaches were hurt to some extent but no exact estimate is available. (Barss, May 18).

Plum and prune.

Massachusetts: On April 19 and 20 plums were injured to some extent, especially in the western part of the state. The freezing, however, resulted only in thinning out of the blossoms and there will be a good crop unless further injury occurs. (Osmun, May 24).

Pennsylvania: Plum crop very light in most of the counties reporting, ranging from none in Greene and Lycoming Counties to 85% in Wayne County, but mostly from 5% to 15%, averaging about 20%. (Thurston, June 1).

Delaware: All the plums are killed. (Manns, May 13).

Dean McCue estimates plums a total loss in Delaware. (Adams, May 14).

Virginia: Plums were also almost a complete loss. (Fromme, May 13).
(Rockbridge County) - From the reports, there will be no plums produced in this region this year. (Hoyt, June 11).

West Virginia: The stone fruits are very largely killed in the eastern and southern parts of the state. I am not so certain as to conditions in the central part. (Giddings, May 13).

Arkansas: All fruit except a small percent of late strawberries was killed by frost in northwest Arkansas during April. (Elliott, May 16).

Ohio: Plums appear to have been destroyed by frost injury essentially over the same area as that described for peaches. (Selby, May 14).

Nebraska: Plums practically all killed. (Howard, May 17).

Utah: The plum crop is light. (O'Gara, May 16).

Nevada: Plums are almost a total loss in central and west-central Nevada. (Lantz, May 23).

Oregon: In the Umpqua Valley, in Douglas County, there was no injury whatsoever by frost in the fruit, although some considerable shedding in the prune orchards is now said to be taking place as a result, perhaps, of cold rains at the bloom period. In the Willamette Valley no injury is reported to prunes from frost although there is a very light stand due to cold, wet weather at bloom time. It seems now that perhaps not more than 20% of a crop will be harvested in this section. (Barss, May 18).

Cherry

Massachusetts: On April 19 and 20 cherrries were injured to some extent, especially in the western part of the state. The freezing, however, resulted only in thinning out of the blossoms and there will be a good crop unless further injury occurs. (Osmun, May 24).

Pennsylvania: Cherries severely injured over most of state; total loss in several widely separated counties, probable crop mostly from 2-10%, but 75% reported in Crawford County, and 50% in Wayne County. Average crop about 12%. (Thurston, June 1).

Delaware: All the cherries, except wild cherries, are killed. (Manns, May 13).

Virginia: Cherries were almost a complete loss. (Fromme, May 13).
(Rockbridge County) - From the reports there will be no cherries produced in this region this year. (Hoyt, June 11).

West Virginia: The stone fruits are very largely killed in the eastern and southern parts of the state. I am not so certain as to conditions in the central part. Mr. Berg reports sour cherries as being the only stone fruit which shows any crop in the Kanawha Valley section, and it shows injury from frost. (Giddings, May 13).

Kentucky: The fruit crop, including cherries, has been completely ruined throughout the Bluegrass section of Kentucky and probably along the Ohio River in the western end of the state, although I am not positive as to the extent of injury there. In the southwestern part of the state in Christian and Logan Counties, cherries were apparently not injured. (Valleau, May 16).

Ohio: No available data on sweet cherries as to limits of injury, which has been marked southward. Sour cherries show part of a crop over nearly the entire state, with larger proportions set in the northern third, possibly not reaching a full crop except in the areas where peaches and plums survived freezing injury. (Selby, May 14).

Nebraska: Sour cherries promise from 10 to 30% of a crop. (Howard, May 17).

Utah: The sweet cherry crop is light. Sour cherries seem to have come through the freeze in fair shape. (O'Gara, May 16)

Nevada: Cherries are almost a total loss in central and west-central Nevada. (Lantz, May 23)

Strawberry

Massachusetts: Strawberries in the eastern part of the state suffered about 50% damage on May 12. In the western section the injury was negligible. (Osmun, May 24)

Delaware: Strawberries have been injured some but not as much as was at first supposed. (Manns, May 13)

In the freeze of March 27 and 28 strawberries were slightly affected. At the time of the second freeze, April 11 and 12, they were more advanced and were hit hard. They have recovered from this setback and probably a 70% crop will be harvested. (Adams, May 14)

Virginia: (Rockbridge County) - From what I can learn all fruits in this county, and apparently in this whole region, have been practically completely destroyed. The only fruits left are the blackberries and some strawberries. (Hoyt, June 11)

Kentucky: An occasional strawberry bed was injured slightly, but the loss will be practically nothing in strawberries. (Valleau, May 16)

Arkansas: All fruit except a small percent of late strawberries was killed by frost in northwest Arkansas during April. (Elliott, May 16)

Illinois: Strawberries were injured, and I should estimate a third of a crop for this locality (Urbana), and about 50% of a crop in southern Illinois. (Anderson, June 9)

Nebraska: Strawberries promise practically a full crop. (Howard, May 17)

Other fruits

Pennsylvania: Grapes not injured or only slightly so in most counties. In Erie County 35% of a crop is reported, in Lancaster County 80%, in Juniata County 90%, otherwise the crop is practically uninjured. The average crop is about 93%. Bush fruits were also not badly hurt, the average crop being about 90%. (Thurston, June 1)

Delaware: Grapes are hit heavily, hard to tell how much yet. (Manns, May 13)

Grapes were slightly advanced at the time of the first freeze, March 27 and 28, but not more than .5% of the advanced buds were affected. The second freeze, April 11 and 12, killed 90% of the new shoots. Growth has recovered and adventitious buds are developing. Dean McCue

estimates 70% reduction in yield of grapes as a result of frost injury. Currants and gooseberries show considerable injury to leaves following second freeze and only 50% of a normal set of fruit is expected.

Virginia: (Rockbridge County) - From what I can learn all fruits in this county, and apparently in this whole region, have been practically completely destroyed. The only fruits left are the blackberries and some strawberries. (Hoyt, June 11)

North Carolina: All of the grapes at the Pender Test Farm were killed. (Foster, April 23)

Illinois: Raspberries and blackberries escaped in most localities, but raspberries suffered both by the shoots being killed back and by the canes being frozen. The latter is probably partly the result of winter conditions. Grapes do not seem to have suffered injury, so far as I can learn. (Anderson, June 9)

Nebraska: Grapes promise 50-75% of a crop; gooseberries and currants 10-20%. (Howard, May 17)

Utah: The apricot crop, which is of very little importance in Utah, is light. (O'Gara, May 16)

APPLE

Scab caused by Venturia inaequalis

According to reports of field men of the New York State College of Agriculture, apple scab is prevalent in unsprayed or improperly sprayed orchards in that state. Many orchards which usually receive good care were not well sprayed this year, probably because of both unfavorable weather at the proper time for application and lack of interest in the reduced crop resulting from frost injury. Mature ascospores were first observed about April 6 in Onondaga County and April 18 in Wayne County. Rains in April and May favored the development of the fungus. Most reports state that the disease is practically absent from orchards sprayed according to Farm Bureau recommendations. Abundant secondary infections were noted May 20 in an Orleans County orchard which had been dusted.

Scab has become so prevalent in parts of Ohio, according to reports from Selby and Clayton, that the Botany Department of the State University has sent out notices warning growers of the necessity of protecting the trees from serious defoliation. The disease was first noticed in the southern part of the state on April 25, and is now serious in southern, western, central, and north-central Ohio, and probably occurs throughout the state.

In Virginia, discharge of ascospores was noted by Fromme on March 25. In West Virginia the disease was first observed on April 25, but weather conditions were said to be not especially favorable for infection at that time. Scab has also been reported locally from Connecticut and Indiana.

FIELD AND VEGETABLE CROPS

POTATO

Potato germination troubles

An unusual number of missing hills was reported in April in early potato fields in the Norfolk and Eastern Shore section of Virginia and the eastern part of North Carolina. In some cases the stand was reduced from 50-75% and the fields were plowed up and replanted. The average reduction in stand in Virginia, however, was not more than 20%, according to Fromme, while in North Carolina the probable reduction in the crop of affected fields was estimated at 50% by W. B. Mabee, Extension Entomologist.

The trouble was found to be caused by complete or partial destruction of the seed-piece by the seed-corn maggot or various fungi, especially Fusarium sp., or both together. In some cases it was difficult to distinguish the original cause of the injury. The serious nature of the damage was accounted for by the unusual weather conditions prevailing during and shortly after the planting season. Regarding this, Fromme says (April 11):

> "Air temperatures during February and March have been unusually high and precipitation has been unusually low. This combination of high air temperature and low soil moisture no doubt caused unusually high soil temperatures during, and immediately following, the planting season..... There is considerable difference between fields planted on different dates, the early plantings being the worst. The rotting is most prevalent on high ground and on the lighter soils. The better stands in severely infected fields are found on the lower ground."

Mr. M. Shapovalov, who visited the Norfolk section April 11-17, reported concerning the same condition as follows:

> "The ascertaining of the immediate causes of the germination trouble now prevalent in some parts of the country at once raises the question as to why the fungus rot as well as the maggot injury are so extremely serious this year. In this respect observations point out to a correlation between the degree of damage and the weather conditions immediately following the planting. The month of March, when most of the planting was done, was exceptionally warm and dry. This is particularly true with regard to the first part of the month. The thermometer was then in the neighborhood of 90° on several days and there was only a fraction of an inch of rainfall. It is therefore quite significant that nearly the entire amount of the seed piece injury falls on the crops planted during this period. Those planted later showed good stands. Since high temperatures favor the development of various parasitic fungi such as Fusarium oxysporum, the above mentioned

coincidence is quite clear. The low precipitation, on the other hand, might have been unfavorable to the normal activities of the potato plant, retarding its germination and growth and thus indirectly weakening its resistance to invasion. The apparently detrimental effect of high soil temperature and its low moisture contents on the condition of the potato seed pieces is further demonstrated by the fact that in the same field most of the damage was confined to elevated spots with light sandy soil while in lower places it was much less significant and sometimes entirely absent. These low places of fields are usually moist and cooler. Such a situation is quite analgous to that existing sometimes in irrigated sections of the West. It has been noted there that fields or parts of fields which receive plenty of water during the hottest summer period can withstand the wilt attack better than those which are kept relatively dry."

From reports of field men of the New York State College of Agriculture, it appears that germination trouble is prevalent in parts of New York also, particularly in Nassau County on Long Island and in Genesee and Orleans Counties. Rotting of the sprouts by Rhizoctonia is apparently the chief cause of the damage in that state, although seed-piece rot caused by other organisms, and inferior seed due to poor winter storage which lowered the vitality of the tubers, as well as to inherently poor quality of the tuber itself, are important contributing factors. Rhizoctonia has been commonly reported in stock raised from seed which was treated last year.

In response to the special memorandum concerning these troubles which was sent from this Office, April 29, J. J. Taubenhaus reports a similar condition in Texas, as follows (May 4):

"In Texas, this year, we have a condition which is no less serious than that in Virginia and North Carolina. We had practically the same weather conditions as they had in Virginia. Furthermore, during the last six weeks our rainfall precipitation was abnormally high for this time of the year. This condition resulted in practically ruining over 60% of our potato crop. All potatoes grown on flat lands, especially heavy lands, are a total failure. I have personally examined many instances where potatoes have recently rotted and the cause of the trouble is, undoubtedly, a Fusarium in combination with bacterial soft rot (slimy soft rot). I have as yet received no report from eastern Texas."

TOBACCO

Downy mildew, a new disease caused by Peronospora sp.

On April 22 a memorandum was sent from this Office to collaborators in tobacco states calling their attention to a destructive new disease of tobacco, which appeared in March in the cigar-wrapper (Gadsden-Decatur) section of Florida and Georgia. So far as is known at the present time, it is confined to this region.

The disease was investigated by Mr. R. E. B. McKenney of this Department, who visited the affected localities. The outbreak was extremely serious in seed-beds, spreading very rapidly, and was also found in fields where the plants had been set out under shade. Hot dry weather in the early part of May, however, checked the ravages of the disease, so that the loss from it, if present conditions continue, will not exceed 5%.

A Department Circular by E. F. Smith and R. E. B. McKenney has been issued, containing suggestions as to the control of the disease. Among methods recommended are:

Thorough sanitation and sterilization of seed-beds, including soil, frame, and cover.

Use of seed from disease-free plants.

Removal of diseased leaves in tobacco fields, and spraying with bordeaux, not stronger than 2-2-50.

The disease has been found occurring naturally on a white-flowered tobacco in a garden. It is thought likely that other solanaceous plants may also be attacked, which would complicate the problem of effective control.

Wildfire caused by Bacterium tabacum

Wildfire is said to be causing considerable damage in seed-beds in Massachusetts, Connecticut, and Kentucky, and according to E. E. Clayton, occurs in a few places in Brown and Clermont Counties in Ohio. The disease is also reported by the Bureau of Crop Estimates from Tennessee.

Massachusetts: Practically the same condition as reported by Dr. Clinton is found in this state, although I do not think the disease has become quite so serious here. It appears to be spreading, however, and should weather conditions favorable to wildfire prevail after the plants are set in the field, I fear the result may be disastrous. (Osmun, May 14)

Connecticut: Wildfire has broken out in the seed-beds of Connecticut in a number of places and seems to be very destructive to the small plants, forming a wet rot of the leaves an inch or so in diameter, which rapidly die from the tip inward. A week or ten days later on the larger plants with leaves a couple of inches in length, the characteristic yellow halo spots are evident forming away from the margins of the leaves, and apparently developing slower. This disease first appeared in a bed in which the seed and soil were both sterilized. Apparently flea beetles are active in spreading it. (Clinton, May 10)

Kentucky: Wildfire disease has broken out seriously again in our seed-beds in several sections of the state. (Valleau, April 25)

The wildfire and angular leaf spot have broken out in practically all sections of Kentucky in the seed-beds. The disease is particularly severe throughout the Burley section where practically every bed is badly diseased. In the dark section in the southwestern part of the state the injury is not so serious as in this section, as the plant beds are much earlier and the weather conditions have not been so favorable for the spread of the disease. A considerable amount of tobacco has already been set in the field, some of it from diseased beds and others from beds which appear to be free. You may look for a considerable amount of trouble throughout this section of the country

with these diseases during the coming summer. (Valleau, May 16)

Angular-spot caused by Bacterium angulatum

Angular-spot has been reported to date from Kentucky only, where it is doing some damage in conjunction with wildfire, as indicated in the report of May 16 given under that disease.

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